DOCUMENT RESUME

ED 310 142 TM 013 725

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TITLE The Concept of Instructional Cues. Twente Educational Memorandum Number 24.
INSTITUTION Twente Univ., Enschede (Netherlands). Dept. of Education.
PUB DATE Nov 80
NOTE 28p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cues; Learning Processes; Transfer of Training
IDENTIFIERS *Instructional Theory

ABSTRACT

This paper addresses instructional cues and begins with an attempt to determine the position of cues and to place them in a theoretical context. This is done by using a theory of school learning developed by B. S. Bloom (1976). Next, an attempt is made to define the concept of cues. Cues are a part of the quality of instruction or the quality of teaching, including both information to be imparted and directions for providing for adequate absorption and processing of the information included in the material to be learned. It appears that the events of instruction, as outlined by R. M. Gagne, conform to both the requirements of the definition and can be conceived of as being instructional cues. These events include gaining attention, informing the learner of the objective, stimulating recall of prerequisite learning, presenting the stimulus material, providing learning guidance, eliciting the performance, providing feedback about performance correctness, assessing the performance, and enhancing retention and transfer. A brief description of particular cues and a brief review of some research findings in this field are presented. (TJH)

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TWENTE EDUCATIONAL MEMORANDUM NUMBER 24

THE CONCEPT OF INSTRUCTIONAL CUES

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Typist	: E.v.d.Velde - Heskamp
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Edition	: 60

THE CONCEPT OF INSTRUCTIONAL CUES

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Publication project 030 Classroom Environment Study

Twente Educational Memorandum No. 24, Enschede, The Netherlands: Twente University of Technology, Department of Applied Education, November 1980.

Abstract

In this paper which is about instructional cues, we try in section one to determine the position of cues and to place them in a theoretical context. This can be done by using a theory of school learning developed by Bloom.
In section two we make an attempt to define the concept of cues. In terms of this definition which is made up of two parts, it appears that the events of instruction as listed by Gagné conform to both the requirements of the definition and can be conceived being instructional cues. (section three).
Further, in section four, a brief description of particular cues is presented.
Finally, in section five, we give a very brief review of some research findings in this field.

1. Introduction

In this section we intend to determine the position of instructional cues. We want to place the cues in a clear context by refering to a theory of school learning in which a substantial place is assigned to cues. Such a theory is available and is presented by Bloom in his book Human characteristics and school learning. (Bloom, 1976). In this book an extensive description is given how matters stand as for mastery learning strategy. Results obtained with this strategy for the greater part can be predicted and influenced by a few variables. These variables are the quality of instruction and pupil characteristics like cognitive entry behaviors and affective entry characteristics.

On the ground of this description he has developed a theory of school learning that attempts to explain individual differences in school learning as well as to determine the ways in which such differences may be altered.

The quality of instruction in this theory is determined by the components participation, reinforcement, providing the learner with cues, feedback and correctives.

By participation we mean the extent to which the pupil actively participates or engages in the learning. In the learning process active involvement of the pupil is required.

Reinforcement refers to the extent to which the pupil is rewarded or reinforced in his learning.

Cues have reference to the instruction as to what is to be learned

as well as the directions as to what the learner is to do in the learning process. In this paper we will particularly go further into this aspect of cues.

Feedback is used to inform the pupil about what he has learned well and what he still needs to learn. Corrective procedures are used for purposes to help the pupil correct the learning.

Looking at this point of the theory we agree with De Klerk (1979) that the prescriptions are rather peripheral. There are no prescriptions that are more central in nature e.g. directions how individual pupils absorb and process the learning material.

As stated above instructional cues appear to be a substantial component in the quality of instruction. In this connection it is worth noting that Rosenshine and Furst (1971, 1973) in reviewing on findings in the research on the relationship between classroom instruction and gain in pupils achievement identified ten variables as having yielded the most consistent results up to the time of writing their articles. Three of these variables listed by them are the use of structuring comments at the start of and during the lesson, clarity and context covered by the pupils. These variables can be considered being instructional cues in our view as we will see in section three.

Fortunately systematic studies and experiments have begun on these variables which can be numbered among the concept of instructional cues.

2. What instructional cues are.

The term cue strikes us somewhat as strange at first sight. In the world of theater it means a hint or a kind of token to be given to the actor.

The last years it turns up more and more in educational literature.

In Briggs' glossary (Briggs, 1977) e.g. the term cue is reserved for an indirect prompt given to help the learner complete a recitation or solve a problem. It is an indirect form of learning guidance, that is to say one does not go so far to give simply the missing word or solution to the pupil. The intention here is that the learner gets some kind of help in the learning process. But the meaning of the concept is not yet similar as in our view of cues.

An essential aspect of any learning is that it includes some parts to be learned or absorbed by the pupil. In the process of instruction it is very important to communicate to the pupil which parts of the learning material must be learned by him.

The method of communicating to the pupil is likely to differ from teacher to teacher. It is obvious that a good teacher has a variety of ways of explaining or illustrating what elements in the learning material are to be learned. Giving information to the pupil about what is to be learned is one aspect that could be distinguished in instructional cues.

Besides emphasizing the elements in the learning material in communicating to the pupil it is on the other hand of great importance to explain the pupil what he is to do with some learning material in the learning process. In other words, this raises the question how one can be helpful in the learning process of the pupils. The pupil needs a teacher or instructional material providing for a variety of directions to help him understand what he is to do in the learning process with some elements in the learning material. He needs focused aid in absorbing and digesting the material.

As stated above these directions may come from the teacher or from the instructional material.

Like teachers may differ as for the variety of available cues pupils may differ in the extent to which they can learn from particular cues.

Furthermore it can be stated that the teacher's activities may determine for a considerable part the pupil's achievement so far as they evoke particular activities in the pupil which can lead to learning.

Anyhow these directions -and this is certainly the case for young learners- come from the external environment. This notion that instructional cues can be viewed as events in the external environment that are used for the absorbing and the processing of the learning material links up very well with information processing models of memory and learning.

We shall end this section by trying to define the concept of

instructional cues: Cues are a part of the quality of instruction or the quality of teaching including both information to be given to the learners as regards to what is to be learned and the directions for providing the adequate absorption and processing of the information included in the learning material.

3. Instructional events conceived as cues.

It can be stated that in our educational system teachers mostly are working alone with their pupils. The instructional materials to be used by the pupils are usually selected rather than developed by the teacher. It can be considered an important task for the teacher which instructional cues are incorporated in the learning materials and which are missing. If according to the teacher, it appears that there are no sufficient cues in the materials he can plan to supply some important ones by himself. This means that the teacher is not only a manager of the instruction but in addition to this he provides for instructional cues which are not present in the learning material.
Generally speaking, cues inform the pupil what he is going to learn and how his learning process should proceed. They can be considered as directions what the pupil is supposed to do during the learning process.
This concept of instructional cues is rather similar to Gagné's events of instruction. From what we have stated before it appears

that we conceive events of instruction as cues,
Gagnē has listed this in several works (Gagnē 1979, 1977),
(Gagnē and Briggs 1974).
Thus instructional events or cues in a lesson can be supplied by the teacher, by the learning material or by the more experienced learner himself.
In Gagnē's work a learning theory is presented which is based on an information processing model. In his theory he deals with complex learning processes. The external learning conditions are of great importance for the internal processes. The external learning conditions must be created by the teacher or the learning materials and they must link up to the internal conditions, the learning of the pupil.
These events of instruction are listed below

- gaining attention
- informing the learner of the objective
- stimulating recall of prerequisite learning
- presenting the stimulus material
- providing learning guidance
- eliciting the performance
- providing feedback about performance correctness
- assessing the performance
- enhancing retention and transfer.

In the light of the preceding remarks it sounds plausible that these events can be regarded being instructional cues,since they conform to our definition mentioned in section two.

In educational literature for these cues often other terms are used, but considering the substance they mean the same. It is not to much to say that we all agree that instruction is needed when we want the pupil to reach an acceptable level of performance. There is evidence that most people did not learn e.g. any algebra by themselves, however clever they may have been.

A particular level of competence can be realized by combining the efforts of the pupil, the teacher and the instructional materials.

Instructional cues or at least some of them sometimes can be found in instructional materials. In instructional materials e.g. we can more and more identify objectives presented to the pupil.

Sometimes some suggestions are given how to read or work through the material. If the instructional cues are not present at all, which still occurs, they must be supplied by the teacher or otherwise. In a simple way it has been demonstrated that these events of instruction which we consider to be instructional cues, have empirical evidence (Briggs, 1977).

Support to the importance of instructional cues for the learning process also comes from biological approaches to learning and thinking (Vester, 1975).

Support to some instructional cues is also given by DeLozier (1979). In this paper he discusses that effective teachers are persuasive. To be persuasive teachers must first understand how

to gain and maintain pupil's attention and how to communicate their messages in ways that pupils comprehend.
Before we give a description of each instructional cue we think that these cues are commonly occuring in classrooms characterized by good teaching. Of course this is only a conjecture that still has to be proved.

4. Description of cues.

1. Gaining attention.

A variety of techniques is available to gain, focus and maintain attention. It is obvious that these techniques need to vary with the age of the learner. Gaining attention is quite different with young children than with secondary school pupils.
Gaining, focussing and maintaining attention can be viewed as a prerequisite for effective communication in the instructional process.
A pupils' attention can be regarded as the result of external stimulus factors and individual factors. In this paper we can better leave these personal factors out of consideration, because they are rather difficult to be altered.
DeLozier (1979) summarizes principles of gaining attention which emerge from external factors. The larger an object is, the greater its attention value. Static objects attract less attention than objects in motion. The attention value seems to

be greater when the strength or intensity of a stiumulus is greater. Attention is attracted by novel objects and ideas. A behavior which surprises pupils will gain their attention. The same is true when giving information and raising a conceptual conflict. And finally can be mentioned that multiple sensory messages produce greater attention than messages appealing to only one sense mode. This point is also strongly endorsed by the biological approach to the research on learning (Vester, 1975).

When instructing a teacher wants to gain attention in order to direct the pupil's activity toward a particular objective. It is true that this cue does not state what information from the material the pupil must learn, but it makes him ready to start the learning process. It is a necessary step in instruction before learning can begin. This prerequisite for effective communication may facilitate pupil learning.

2. Informing the learner of the objective.

In the research literature suggestions can be found that giving pupils knowledge of the learning objectives is related positively to achievement. It facilitates learning, thus it is an instructional cue.

In practice it may be rather difficult to separate well gaining attention and informing the pupils of the objective. Often both cues go together in a single statement by the teacher. It is desirable that in school and certainly at the secondary level,

the teacher who raises some content matter must show the value of that learning to the pupils. It is not unusual that pupils do not understand the importance of some topics or objectives in the curriculum. This means that in instruction one must stress the value of the topics of a subject matter and show how they can be used. However, in teaching practice this is not always possible.

Even a great many of pupils can have misconceptions of what a subject is all about. The detail in which objectives should be given to the pupils can be a point of consideration. It is obvious that also this instructional cue needs to vary in detail with the age and experience of the pupil.

Briggs (1977) summarizes some techniques which can be applied to make objectives clear to the pupil.

- The pupil must understand the language in which the objective is formulated.
- The teacher must demonstrate how to perform the objective.
- It is advisable to give practice tests which are parallel forms of the evaluation test.
- If the objective consists of more components the teacher should stress this and show how they contribute to the total objective.
- Explain the pupils what they are expected to do after the objective has been attained.
- It is not wise to hide objectives. It is not advisable to keep the pupils guessing what will be asked in the test.
- Communicate the objective in a variety of ways to the pupils

to make the chance for understanding it greater.

- If possible try to show the value of the objective for later goals the pupils want to achieve.

4.3. Stimulating recall of prerequisite learning.

Stimulating recall of prior learning facilitates new learning. For this reason this should be considered to be important in this context. When the subject matter is organized hierarchically, stimulating recall is nearly always a necessary step. The task of the teacher is to inform the pupils that each new learning of the material requires the use of some prior learning. By stressing this condition and by consistent use of this cue may be the teacher can provide for a kind of habit in the pupil to do this for himself. For the pupil this possibly can result in developing his own learning strategies. It seems obvious that this instructional cue is appropriate for intellectual skills in which complex skills are built upon more simple skills.

4.4. Presenting the stimulus material.

By stimulus material we mean the content which the pupils are expected to learn. In transmitting,the content can be approached in various ways by the teacher.
In case of organized information which has to be learned by the pupils there are many forms in which it can be presented. To aid pupils' learning the teacher can help him by organizing

the information in a meaningful way. Often this is called structuring in educational literature. This structuring can be done e.g. by presenting an outline or an advance organizer. We all know from research literature that a presentation which is too long can obstruct the learning process of many pupils. Fortunately there are some techniques available to facilitate learning even when presentations of the material are quite long. Within this scope we aim at reviews or summaries during the presentation or lecturing. Providing for pupil responding is also an aid for learning. Furthermore providing the pupils with a variety of examples may be very helpful especially in concept and rule learning.

4.5. Providing learning guidance.

Teachers can vary also in applying direct or indirect guidance in instructing their pupils. Roughly speaking there are two forms of guidance with all kinds of variations. When a teacher gives a definition or a rule, followed by some examples this is called deductive. After this the pupil is asked to classify examples and non examples. An opposite form is called inductive where the teacher tries e.g. by questioning to lead the pupils to discover the difference between two different points. Present-day knowledge does not allow a conclusion as for which form of guidance is the best. Guidance can also be considered from the standpoint of the degree of prompting. This is a direct form of guidance where the teacher provides the pupil with a strong hint for instance how

to solve a problem.

For the different types of learning outcomes there are specific forms of providing learning guidance. As for problem solving e.g. the teacher can present minimum cues needed to lead the pupil to select and use applicable rules.

4.6. Eliciting the performance.

After a certain period of interaction with the teacher and the instructional material used in the school it is a good point to know if learning has taken place. The function of this demonstration is to estimate whether the pupil has reached sufficient mastery so that he can go on to learn next competencies. Both for the teacher and the pupils it is necessary to check if there is progress in learning.

Also supplementing instruction can be given when needed.

It is possible to realize this aim by using some techniques derived from learning psychology. One knows that not everything what is instructed is retained well. Usually skills are retained better than historical dates. If the teacher whishes that information-type objectives will result in more long term retention. he must review the information reasonably often.

Furthermore it is important and a good habit to require that the learned material is generalizable.

When a pupil has mastered to solve quadratic equations, he has acquired the capability to solve a lot of problems of this kind. This phenomenon is called generalization.

As for the retention of skills this can be reached by learning to generalize them soon after the first time they have been learned. To realize this the teacher can incorporate generalizing experiences in his instruction after he has taught and demonstrated the skill. By doing so he can promote transfer.

As for providing feedback and performance assesment we can be very short. Of course it can be stated that feedback given by the teacher is an essential part in the theory of school learning. The pupil wants and has the right to know whether his performance was successful. This is a good condition for the learning process. When the teacher asks for a performance and gives feedback to the pupil after his response this combination can be called performance assessment.

5. Some research findings on instructional cues.

In the last few years and particulary in the last decade research activities on what we now call instructional cues have started. The flow of publications is increasing gradually. It is not in the scope of this paper to give an extensive review of the recent research that has been done in this field.(We intend to do this in another paper). Nevertheless we can say some words about it and restrict ourselves to a few findings.
Most research on cues that has been reported refers to cues as a rather broad category. The composition of the categories in

different studies may vary. This fact makes it very difficult to draw general conclusions about the impact of particular cues on pupils' achievement. Within this approach we will very short discuss some findings on cues variables relating to structuring, content organization, and content coverage.

An exception to this approach were different instructional cues are taken together in one category, is the research on the influence of explicitly stated objectives on achievement.

Once again we state that this is only a brief review narrowed down to some research findings.

5.1. Bloom's review.

In his chapter about the quality of instruction Bloom (1976) deals among others with the relation between the cues provided to a class and the achievement of the pupils.

He summarizes a great many of studies which made use of correlations between the quality of the cues and the final learning level of groups of pupils. Bloom reports that this correlation is about .38.

The median correlation between the quality of the cues and the gains in achievement of groups of pupils was .53.

It can be estimated that about 14% of the variance in the achievement of groups of pupils is at present accounted for by the quality of the cues.

Not yet available are publications which deal with the relation between the cues and the learning gains of individual pupils.

Bloom recognizes well that in most studies that he quotes, attention was paid to dimensions like the difficulty of instruction, the clarity of ideas and concepts during class instruction, and the extent to which the instruction was interesting or dynamic.
It is not quite sure whether this suits the concept of cues as we have defined them.

5.2. The Clark et al.study.

In an experiment by Clark et al.(1979) one cluster of teacher behavior variables was structuring.
This category structuring consists of telling the pupils what is going to happen next, the learning material to be examined and how the material will be dealt with.
In the treatment structuring was devided into high and low.
High structuring was further specified as:

- reviewing the main ideas and facts covered in the lesson.
- stating objectives at the beginning of the lesson.
- outlining the lesson content.
- signalling transitions between parts of a lesson.
- indicating important points in a lesson.
- summarizing the parts of the lesson as the lesson proceeded.

It can be stated that the enumeration above could be considered being cues as in our definition. The cues-items have a strong resemblance with the events of instruction which have been discussed before.

The conclusion of this study is that the treatment variations indeed affect pupil achievement. High structuring was effective. It is interesting to see that positive effects were also found three weeks after the end of the teaching for the measures of retention. Here high structuring was effective too in bringing about achievement. The authors infer that on the retention test high structuring was effective. It must be said, in fairness, that this effect was found in combination with low soliciting and high reacting.

5.3. The Anderson et al study.

Anderson et al.(1979) before doing an experiment, developed an instructional model, about the functioning of young children in a small-group setting.

The first part of the model dealt with management of the group as a whole and the second part emphasized the responses that teachers give in feedback to pupils' answers.

The purpose of the model was to get and maintain attention, to sequence information clearly to the pupils and to provide information about the relevant aspects of a question or an answer. The teachers were asked to use four principles as guidelines which were concerned with introducing the lesson and new material. The function of the principles was to prepare the pupils for the lesson by getting their attention and making sure that the pupils know what to do in activities.

The four principles are:

- The introduction to the lesson should give an overview of what is to come in order to mentally prepare the pupils for the presentation.
- It is also at the beginning of the lesson that new words and sounds should be presented to the pupils so that they can use them later when they are reading or answering questions.
- The teacher should have the pupils repeat new words or sounds until they are said satisfactorily.
- After moving into the lesson, but before asking the pupils to use new material or undertake new tasks, the teacher should present a demonstration or an explanation of any new activity.

Anderson et al conclude that the absence of giving overviews of any kind to introduce lessons is negatively related to achievement. The same is true for new words given to the pupil with no directions about how to read them.
They suggest that using overviews will have an impact on pupil achievement.

5.4. Rosenshine's review.

In his article Rosenshine (1979) reviews research findings in the field of content covered by the class.
In his view variables that are related to content covered and task orientation or academic focus are the most promising for future research. This research approach is characterized by focusing on the pupil, particularly on the content which the pupil covers or masters. Important are the amount of time the

pupil is engaged in academically relevant tasks and also the settings which promote engagement.

Content covered by the pupil is measured by determining the opportunity to learn and the amount of relevant material that has been covered. Rosenshine gives an enumeration of the many ways in which the variable relating to content coverage has been studied:

- inspecting the content of textbooks used
- asking teachers to indicate the percentage of pupils who have had an opportunity to learn each item on a test.
- counting the number of pages of the common textbook covered during a semester.
- coding the content in a short presentation that was relevant to the test questions.
- counting the number of words that the teacher attempted to teach.
- counting the number of mathematics problems covered.
- comparing the results of different curriculum programs on general and on curriculum-related posttests.
- coding the level of the workbook the pupils had completed just before they took a posttest.

Rosenshine's conclusion is that in most studies a significant relationship was found between content covered and gains in pupils' achievement.

5.5. Levin's review.

Above we already mentioned that the cue informing the pupils about learning objectives and its relation to achievement has been studied separately.

Some studies dealing with the effects of informing the pupils of learning objectives on their achievement are reviewed by Levin (1977). She concludes prudently that the statement of the learning objectives as an instructional cue, can have a positive effect on pupils' achievement. However, as for this topic, there are too many contradictory studies. We need more consistent findings.

5.6. Duell's study.

Duell (1974) studied the effects on learning of providing students with objectives stated in behavioral terms as they study text materials. The purpose was to discover under what conditions providing objectives during study improves the amount learned.

The data of the study support the hypothesis that the judged importance of an item of information determines whether knowlegde of objectives during training is helpful. Students receiving behavioral objectives during the training performed better on test questions that the majority of the students classified as unimportant than students given a nonbehavioral objective.

The findings support the assumption that providing students with behavioral objectives produces greater learning. This is only true if the objectives direct the student to learn information which he would not classify as important or likely to be tested.

References

Anderson, L.M., Evertson, C.M., Brophy, J.E., An experimental study of effective teaching in first-grade reading groups. In: The elementary school journal, 79, nr. 4, 1979, 193-223.

Bloom, B.S., Human characteristics and school learning. New York: McGraw-Hill, 1976.

Briggs, L.J.(ed), Instructional design. Principles and applications. Englewood Cliffs, N.J.: Educational technology publications, 1977.

Clark, C.M., Gage, N.L., Marx, R.W., Peterson, P.L., Stayrook, N.G., Winne, P.H., A factorial experiment on teacher structuring, soliciting and reacting. In: Journal of educational psychology, 71, 1979, 534-552.

DeLozier, M.W., The teacher as performer: the art of selling students on learning. In: Contemporary education, 51, nr. 1, 1979, 19-25.

Duell, O.K., Effect of type of objective, level of test questions, and the judged importance of tested materials upon posttest performance. In: Journal of educational psychology, 66, nr.2, 1974, 225-232.

Gagnē, R.M., Essentials of learning for instruction.
Illinois: Hinsdale, 1974.

Gagnē, R.M., The conditions of learning.
New York: Holt, Rinehart and Winston, 1977, 3rd edition.

Gagnē, R.M. and Briggs, L.J., Principles of instructional design.
New York: Holt, Rinehart and Winston, 1974.

I.E.A., Research proposal, Classroom Environment Study: teaching for learning, 1980.

Levin, T. Trends and findings in classroom environment research.
Tel-Aviv: Tel-Aviv university, 1977.

Rosenshine, B.V., Content, time and direct instruction.
In: Peterson, P.L. and Walberg, H.J. (eds), Research on teaching.
Berkley: McCutchan publishing corporation, 1979.

Rosenshine, B.V. and Furst, N.F., Research on teacher performance criteria.
In: Smith, B.O. (ed), Research in teacher education: A simposium.
Englewood Cliffs, N.J.: Prentice-Hall, 1971.

Rosenshine, B.V. and Furst, N.F., The use of direct observation to study teaching.
In: Travers, R.M.W. (ed), Second handbook of research on teaching.
Chicago: Rand McNally, 1973.

Vester, F., Denken. Lernen, Vergessen.
Stuttgart: Deutsche Verlags-Anstalt, 1975.